

NCTCOG's Dynamic Traffic Assignment Feasibility Study

**Travel Model Development
and
Data Management**

Presented to

TMIP

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- Rationale for DTA
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- Partnership with the University of Texas



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Travel Model Development

Rationale for DTA

- Policy Change
- Analytical Need
- Modeling Improvement



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Rationale for DTA – Policy Change

- **Policy Change**
 - Shortage of money
 - Transportation funding not keeping up with the degradation of system performance (congestion, safety, etc.)
 - Few major capacity improvement projects
 - Smarter decision making
 - Conventional highway system is approaching its limits in solving mobility issues (limited space, expense, environmental effects)
 - Converting large projects into smaller and more effective projects (interchange improvement vs. highway construction)
 - Diversity in policies considered
 - Creation of operational tools in management of the highway system (HOV, Toll, ...)



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Rationale for DTA – Analytical Need

→ Analytical Need

- High Congestion
 - Static UE incapable of modeling queues and spillovers
- Bottlenecks
 - Development of effective projects
 - Benefit-cost analysis
- HOV, Toll, and Managed Lanes modeling
- ITS and Control Devices modeling



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Rationale for DTA – Modeling Improvement

→ Modeling Improvement

- Scalability of Model
 - Maintaining consistency between the regional and sub-area modeling
- Reasonability of Estimation
 - Traffic assignment virtually drives estimation of all other model estimations (trip distribution, mode choice, etc.)
- Discipline of Data Collection and Inventory Maintenance
 - Need for detailed data collection and maintenance is linked to the model use
 - DTA is unforgiving when it comes to coding mistakes



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NCTCOG's Stepwise Approach

1. Data Collection and Maintenance
 1. Creation of a long range data collection plan
 2. Creation of an enterprise level database system for storage, maintenance, and sharing the data
 3. Organization of existing data
2. Roadway Coding Improvement
 1. Completely rectified network
 2. Development of rigid quality control tools
 3. Development of a highly controlled coding environment
3. Modeling Application
 1. Creation of control environment for application of the model
 2. Development of archiving system
 3. Creation of standard reports
 4. Convenience in using the model
4. Development of Advanced Model
 1. Measurement and reduction of the noise in the static UE
 2. Consideration of hardware improvement (reasonable run times)
 3. Investigation into application of DTA



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DTA Requirements

- Ability to model queues, spillovers, and control devices
- Modeling with 15-minute interval resolution
- Stable and consistent results (proper response to relevant and irrelevant changes)
- Controlled and understandable noise which can be decreased using more resources
- Consistently scaleable in size of the modeling area (from larger to smaller)
- Affordable hardware and run time



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Partnership With UT

- NCTCOG University Partnership Program (UPP) is designed to create a direct communication line between MPO staff and University researchers to the benefit of both sides in research and understanding of the MPO needs.
- UPP enables us to test our possible future improvements in a research environment before committing our resources to unknown risks.
- In DTA partnership, we would like to investigate whether or not a DTA that meets our requirements can be applied in our large-scale modeling area.
- The status of the current work of Dr. Waller's team is that they have been able to run the DTA on the regional model for the AM time period.



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Model Summary

Network Characteristics

- 71,430 links
- 25,841 nodes
- 5,386 Centroids
- 1,480,606 active OD pairs
- Average distance: 7 mi (weighted by demand)

Demand

- 2,529,222 trips(2 hs
- Uniformly profiled in 187'
- **43% of the OD pairs have a demand of 1**
- **95% of the OD pairs have a demand < 5**

Enhanced DTA implementation to improve convergence

DTA Implementation

- Cycles alternating path generation and Dynamic Traffic Assignment iterations
- **Best cycle for this network:**
 - 2 Iterations of path generation (1.5 day total)
 - Up to 7 iterations of DTA (~1.8 day total)

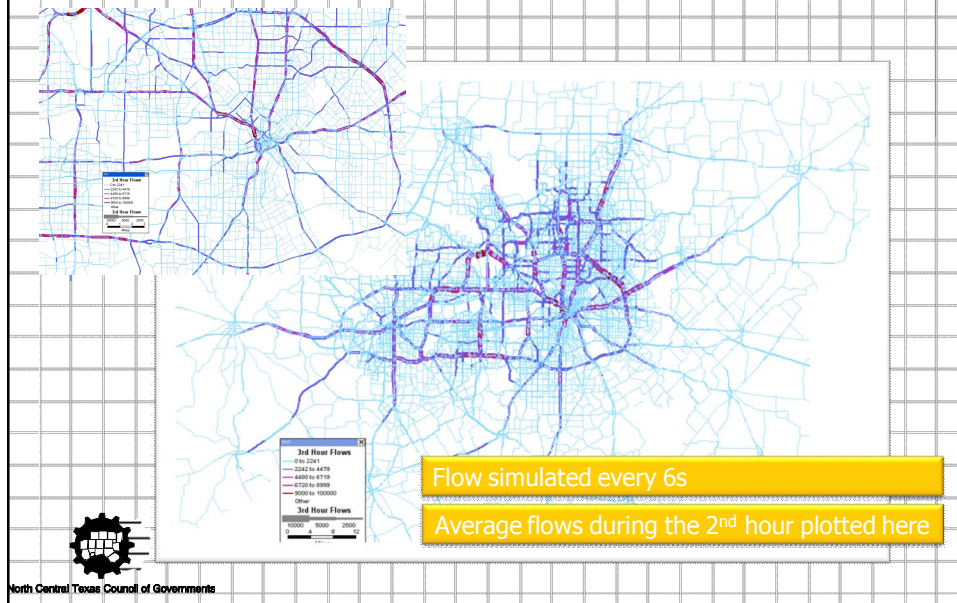
Convergence

- **Gap=0.04 after 2 cycles**
- **96% vehicles below 0.01 gap**
- Maybe improved by running more cycles

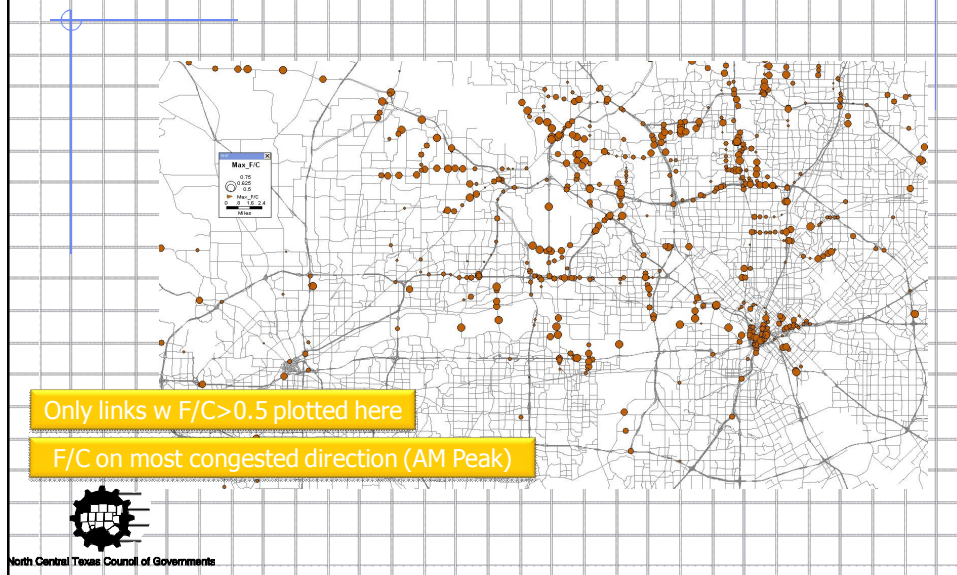


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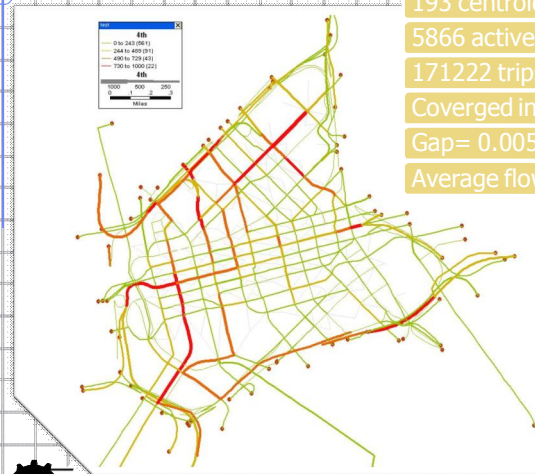
Model Outputs: Dynamic Link Flows



Model Outputs: Dynamic Flow/Capacity Ratio



Subnetwork



350 nodes + 89 dummy centroids

717 links + 187 dummy connectors

193 centroids

5866 active OD pairs

171222 trips

Coverged in 2 cycles (1 hr)

Gap= 0.005%

Average flows during 2nd hr plotted here



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